

SEQUENCE LISTING

<110> Dartois, Veronique A.
Hoch, James A.
Valle, Fernando
Kumar, Manoj

<120> 2, 5-DKG PERMEASES

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<151> 2000-08-04

<150> US 09/677,032

<151> 2000-09-29

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Tyr Ala Glu Arg Arg Ser Val Arg Lys Leu Ile Phe Ile Cys Leu Ile	
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Ser Tyr Thr Leu Leu Val Ile Ala Asn Ala Ala Met Tyr Ala Pro Tyr	
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Lys Phe Ile Gly Trp Ser Leu Leu Ala Trp Ala Val Ile Ser Val Leu																
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1052350

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tgg	tta	ttt	att	atc	gaa	gga	tta	ctg	tcg	gta	gtg	gtt	ctg	gca	gtc	762			
Trp	Leu	Phe	Ile	Ile	Glu	Gly	Leu	Leu	Ser	Val	Val	Val	Leu	Ala	Val				
170				175				180											
tgg	tgg	ctg	atg	gtc	agt	gac	cgc	cct	gaa	gat	gcc	cgt	tgg	ctg	ccg	810			
Trp	Trp	Leu	Met	Val	Ser	Asp	Arg	Pro	Glu	Asp	Ala	Arg	Trp	Leu	Pro				
185				190				195											
gca	gca	gaa	cgg	gaa	tat	ctg	ctg	cgc	gaa	atg	gcc	cgt	gac	aag	gcc	858			
Ala	Ala	Glu	Arg	Glu	Tyr	Leu	Leu	Arg	Glu	Met	Ala	Arg	Asp	Lys	Ala				
200				205				210				215							
gag	cgg	agc	aaa	ctc	cct	ccg	atc	agt	cat	gct	ccc	ctg	caa	gag	gtt	906			
Glu	Arg	Ser	Lys	Leu	Pro	Pro	Ile	Ser	His	Ala	Pro	Leu	Gln	Glu	Val				
220				225				230											
ttc	cat	aac	ccg	ggc	ctg	atg	aag	tta	gtg	att	ctg	aac	ttt	ttc	tat	954			
Phe	His	Asn	Pro	Gly	Leu	Met	Lys	Leu	Val	Ile	Leu	Asn	Phe	Phe	Tyr				
235				240				245											
cag	aca	ggg	gat	tac	gga	tac	act	ctg	tgg	ctg	ccg	act	att	atc	aaa	1002			
Gln	Thr	Gly	Asp	Tyr	Gly	Tyr	Thr	Leu	Trp	Leu	Pro	Thr	Ile	Ile	Lys				
250				255				260											
aac	ctg	acc	gga	gct	agt	att	ggg	aac	gtc	ggg	ttg	ctg	aca	gtg	cta	1050			
Asn	Leu	Thr	Gly	Ala	Ser	Ile	Gly	Asn	Val	Gly	Leu	Leu	Thr	Val	Leu				
265				270				275											
cct	ttt	atc	gcg	acg	tta	tca	ggg	att	tat	gtc	gtc	tct	tac	ctg	agc	1098			
Pro	Phe	Ile	Ala	Thr	Leu	Ser	Gly	Ile	Tyr	Val	Val	Ser	Tyr	Leu	Ser				
280				285				290				295							

Met	Gln	Lys	Ser	Gln	Pro	Gly	Thr	Arg	Trp	Phe	Arg	Ile	Ile	Val	Pro
1				5					10					15	
Ile	Leu	Ile	Ala	Cys	Ile	Met	Ser	Phe	Met	Asp	Arg	Val	Asn	Ile	Ser
			20					25					30		
Phe	Ala	Leu	Pro	Gly	Gly	Met	Glu	Gln	Asp	Leu	Leu	Met	Ser	Ser	Gln
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Met	Ala	Gly	Val	Val	Ser	Gly	Ile	Phe	Phe	Ile	Gly	Tyr	Leu	Phe	Leu

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155 160 165

tgg cgg gaa atg ttt att ttc gag ggt gtg cct gcc tta atc tgg gcc	702
Trp Arg Glu Met Phe Ile Phe Glu Gly Val Pro Ala Leu Ile Trp Ala	
170 175 180	
atc ttc tgg tgg ttt att gtc cgg gac aaa ccg gag cag gtg agc tgg	750
Ile Phe Trp Trp Phe Ile Val Arg Asp Lys Pro Glu Gln Val Ser Trp	
185 190 195	
ctg aca gaa aca gaa aag cag caa ctg gcc agt gca atg gct gaa gag	798
Leu Thr Glu Thr Glu Lys Gln Gln Leu Ala Ser Ala Met Ala Glu Glu	
200 205 210 215	
cag cag gca ata cca ccg atg cgc aat gtg ccg cag gcc ctg cgt tcc	846
Gln Gln Ala Ile Pro Pro Met Arg Asn Val Pro Gln Ala Leu Arg Ser	
220 225 230	
cgc aat gtg gtg gta ctg tgc ctg tta cac gct ctg tgg agc atc gga	894
Arg Asn Val Val Val Leu Cys Leu Leu His Ala Leu Trp Ser Ile Gly	
235 240 245	
gtg tat ggt ttt atg atg tgg atg cca tcg ata ctg cgt agc gct gca	942
Val Tyr Gly Phe Met Met Trp Met Pro Ser Ile Leu Arg Ser Ala Ala	
250 255 260	
tca atg gac att gtc cgg gta ggc tgg ctg gcc gca gtt ccg tat ctg	990
Ser Met Asp Ile Val Arg Val Gly Trp Leu Ala Ala Val Pro Tyr Leu	
265 270 275	
gcc gcg att att act atg ctg gtg att tca tgg ctg tca gat aaa acc	1038
Ala Ala Ile Ile Thr Met Leu Val Ile Ser Trp Leu Ser Asp Lys Thr	
280 285 290 295	
ggg ctg cgt cgg ctt ttt atc tgg cca tta ttg ctg att gcg tca gtt	1086
Gly Leu Arg Arg Leu Phe Ile Trp Pro Leu Leu Leu Ile Ala Ser Val	
300 305 310	
act ttt ttt ggg tcc tgg tta ctt ggg agc tac tca ttc tgg ttt tcc	1134
Thr Phe Phe Gly Ser Trp Leu Leu Gly Ser Tyr Ser Phe Trp Phe Ser	
315 320 325	
tat ggc ttg ctg gta ctg gct gct gct tgt atg tat gcc ccg tat gga	1182
Tyr Gly Leu Leu Val Leu Ala Ala Ala Cys Met Tyr Ala Pro Tyr Gly	
330 335 340	
ccg ttt ttt gcg ttg att cct gaa ttg ctg cca aaa aat gtg gcg ggg	1230
Pro Phe Phe Ala Leu Ile Pro Glu Leu Leu Pro Lys Asn Val Ala Gly	
345 350 355	
att tct atc ggg tta att aac tgt tgc ggg gcg ctg gga gct ttt gcc	1278
Ile Ser Ile Gly Leu Ile Asn Cys Cys Gly Ala Leu Gly Ala Phe Ala	
360 365 370 375	

gga gcc tgg ctg	gtg ggc tat ctt aat ggt ctg acc ggt ggt ccg ggg	1326
Gly Ala Trp Leu	Val Gly Tyr Leu Asn Gly Leu Thr Gly Gly Pro Gly	
	380 385 390	
gct tct tac act ttt atg gcc att gca ttg ctg gtt tct gta ggg ttg		1374
Ala Ser Tyr Thr Phe Met Ala Ile Ala Leu Leu Val Ser Val Gly Leu		
	395 400 405	
gtg ttt ttc ctg aaa gtc cct tca ggg aat ttg gtc act cgt cgg ttg		1422
Val Phe Phe Leu Lys Val Pro Ser Gly Asn Leu Val Thr Arg Arg Leu		
	410 415 420	
ctg aaa ggt gat gca aag taaaaggaat agcgatgaaa cggaacagga		1470
Leu Lys Gly Asp Ala Lys		
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Tyr Gly Phe Ala Ala Ala Ser Gly Ile Glu Ala Asp Leu Gly Ile Ser		
35 40 45		
Arg Gly Thr Ser Ser Leu Ile Gly Ala Leu Phe Phe Leu Gly Tyr Phe		
50 55 60		
Ile Phe Gln Val Pro Gly Ala Ile Tyr Ala Val Lys Arg Ser Val Arg		
65 70 75 80		
Lys Leu Val Phe Thr Ser Leu Leu Leu Trp Gly Phe Cys Ala Ala Ala		
85 90 95		
Thr Gly Leu Ile Ser Asn Ile Pro Ala Leu Met Val Ile Arg Phe Val		
100 105 110		
Leu Gly Val Val Glu Ala Ala Val Met Pro Ala Met Leu Ile Tyr Ile		
115 120 125		
Ser Asn Trp Phe Thr Arg Gln Glu Arg Ser Arg Ala Asn Thr Phe Leu		
130 135 140		
Val Leu Gly Asn Pro Val Thr Val Leu Trp Met Ser Ile Val Ser Gly		
145 150 155 160		
Tyr Leu Ile Asn Ala Phe Gly Trp Arg Glu Met Phe Ile Phe Glu Gly		
165 170 175		
Val Pro Ala Leu Ile Trp Ala Ile Phe Trp Trp Phe Ile Val Arg Asp		
180 185 190		
Lys Pro Glu Gln Val Ser Trp Leu Thr Glu Thr Glu Lys Gln Gln Leu		
195 200 205		
Ala Ser Ala Met Ala Glu Glu Gln Gln Ala Ile Pro Pro Met Arg Asn		
210 215 220		
Val Pro Gln Ala Leu Arg Ser Arg Asn Val Val Val Leu Cys Leu Leu		

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225          230          235          240
His Ala Leu Trp Ser Ile Gly Val Tyr Gly Phe Met Met Trp Met Pro
          245          250          255
Ser Ile Leu Arg Ser Ala Ala Ser Met Asp Ile Val Arg Val Gly Trp
          260          265          270
Leu Ala Ala Val Pro Tyr Leu Ala Ala Ile Ile Thr Met Leu Val Ile
          275          280          285
Ser Trp Leu Ser Asp Lys Thr Gly Leu Arg Arg Leu Phe Ile Trp Pro
          290          295          300
Leu Leu Leu Ile Ala Ser Val Thr Phe Phe Gly Ser Trp Leu Leu Gly
305          310          315          320
Ser Tyr Ser Phe Trp Phe Ser Tyr Gly Leu Leu Val Leu Ala Ala Ala
          325          330          335
Cys Met Tyr Ala Pro Tyr Gly Pro Phe Phe Ala Leu Ile Pro Glu Leu
          340          345          350
Leu Pro Lys Asn Val Ala Gly Ile Ser Ile Gly Leu Ile Asn Cys Cys
          355          360          365
Gly Ala Leu Gly Ala Phe Ala Gly Ala Trp Leu Val Gly Tyr Leu Asn
          370          375          380
Gly Leu Thr Gly Gly Pro Gly Ala Ser Tyr Thr Phe Met Ala Ile Ala
385          390          395          400
Leu Leu Val Ser Val Gly Leu Val Phe Phe Leu Lys Val Pro Ser Gly
          405          410          415
Asn Leu Val Thr Arg Arg Leu Leu Lys Gly Asp Ala Lys
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<210> 11
<211> 1500
<212> DNA
<213> Klebsiella oxytoca

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<220>
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<222> (70)...(1386)

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      Met Asn Ile Thr Ser Asn Ser Thr Thr Lys Asp Ile Pro Arg
        1              5              10

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cag cgc tgg tta aga atc att ccg cct ata ctg atc act tgt att att 159
Gln Arg Trp Leu Arg Ile Ile Pro Pro Ile Leu Ile Thr Cys Ile Ile
  15              20              25              30

```

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tct tat atg gac cgg gtc aat att gcc ttt gcg atg ccc gga ggt atg 207
Ser Tyr Met Asp Arg Val Asn Ile Ala Phe Ala Met Pro Gly Gly Met
      35              40              45

```

```

gat gcc gac tta ggt att tcc gcc acc atg gcg ggg ctg gcg ggc ggt 255
Asp Ala Asp Leu Gly Ile Ser Ala Thr Met Ala Gly Leu Ala Gly Gly
      50              55              60

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att ttc ttt atc ggt tat cta ttt tta cag gtt ccc ggc ggg aaa att	303
Ile Phe Phe Ile Gly Tyr Leu Phe Leu Gln Val Pro Gly Gly Lys Ile	
65 70 75	
gcc gtt cac ggt agc ggt aag aaa ttt atc ggc tgg tcg ctg gtc gcc	351
Ala Val His Gly Ser Gly Lys Lys Phe Ile Gly Trp Ser Leu Val Ala	
80 85 90	
tgg gcg gtc atc tcc gtg ctg acg ggg tta att acc aat cag tac cag	399
Trp Ala Val Ile Ser Val Leu Thr Gly Leu Ile Thr Asn Gln Tyr Gln	
95 100 105 110	
ctg ctg gcc ctg cgc ttc tta ctg ggc gtg gcg gaa ggc ggt atg ctg	447
Leu Leu Ala Leu Arg Phe Leu Leu Gly Val Ala Glu Gly Gly Met Leu	
115 120 125	
ccg gtc gtt ctc acg atg atc agt aac tgg ttc ccc gac gct gaa cgc	495
Pro Val Val Leu Thr Met Ile Ser Asn Trp Phe Pro Asp Ala Glu Arg	
130 135 140	
ggt cgc gcc aac gcg att gtc att atg ttt gtg ccg att gcc ggg att	543
Gly Arg Ala Asn Ala Ile Val Ile Met Phe Val Pro Ile Ala Gly Ile	
145 150 155	
atc acc gcc cca ctc tca ggc tgg att atc acg gtt ctc gac tgg cgc	591
Ile Thr Ala Pro Leu Ser Gly Trp Ile Ile Thr Val Leu Asp Trp Arg	
160 165 170	
tgg ctg ttt att atc gaa ggt ttg ctc tcg ctg gtt gtt ctg gtt ctg	639
Trp Leu Phe Ile Ile Glu Gly Leu Leu Ser Leu Val Val Leu Val Leu	
175 180 185 190	
tgg gca tac acc atc tat gac cgt ccg cag gaa gcg cgc tgg att tcc	687
Trp Ala Tyr Thr Ile Tyr Asp Arg Pro Gln Glu Ala Arg Trp Ile Ser	
195 200 205	
gaa gca gag aag cgc tat ctg gtc gag acg ctg gcc gcg gag caa aaa	735
Glu Ala Glu Lys Arg Tyr Leu Val Glu Thr Leu Ala Ala Glu Gln Lys	
210 215 220	
gcc att gcc ggc acc gag gtg aaa aac gcc tct ctg agc gcc gtt ctc	783
Ala Ile Ala Gly Thr Glu Val Lys Asn Ala Ser Leu Ser Ala Val Leu	
225 230 235	
tcc gac aaa acc atg tgg cag ctt atc gcc ctg aac ttc ttc tac cag	831
Ser Asp Lys Thr Met Trp Gln Leu Ile Ala Leu Asn Phe Phe Tyr Gln	
240 245 250	
acc ggc att tac ggc tac acc ctg tgg cta ccc acc att ctg aaa gaa	879
Thr Gly Ile Tyr Gly Tyr Thr Leu Trp Leu Pro Thr Ile Leu Lys Glu	
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<210> 12
<211> 439
<212> PRT
<213> Klebsiella oxytoca
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			20					25					30		
Met	Asp	Arg	Val	Asn	Ile	Ala	Phe	Ala	Met	Pro	Gly	Gly	Met	Asp	Ala
		35					40					45			
Asp	Leu	Gly	Ile	Ser	Ala	Thr	Met	Ala	Gly	Leu	Ala	Gly	Gly	Ile	Phe
	50					55					60				
Phe	Ile	Gly	Tyr	Leu	Phe	Leu	Gln	Val	Pro	Gly	Gly	Lys	Ile	Ala	Val
65					70					75					80
His	Gly	Ser	Gly	Lys	Lys	Phe	Ile	Gly	Trp	Ser	Leu	Val	Ala	Trp	Ala
				85					90					95	
Val	Ile	Ser	Val	Leu	Thr	Gly	Leu	Ile	Thr	Asn	Gln	Tyr	Gln	Leu	Leu
			100					105					110		
Ala	Leu	Arg	Phe	Leu	Leu	Gly	Val	Ala	Glu	Gly	Gly	Met	Leu	Pro	Val
		115				120						125			
Val	Leu	Thr	Met	Ile	Ser	Asn	Trp	Phe	Pro	Asp	Ala	Glu	Arg	Gly	Arg
	130					135					140				
Ala	Asn	Ala	Ile	Val	Ile	Met	Phe	Val	Pro	Ile	Ala	Gly	Ile	Ile	Thr
145					150					155					160
Ala	Pro	Leu	Ser	Gly	Trp	Ile	Ile	Thr	Val	Leu	Asp	Trp	Arg	Trp	Leu
				165					170					175	
Phe	Ile	Ile	Glu	Gly	Leu	Leu	Ser	Leu	Val	Val	Leu	Val	Leu	Trp	Ala
			180					185					190		
Tyr	Thr	Ile	Tyr	Asp	Arg	Pro	Gln	Glu	Ala	Arg	Trp	Ile	Ser	Glu	Ala
		195					200					205			
Glu	Lys	Arg	Tyr	Leu	Val	Glu	Thr	Leu	Ala	Ala	Glu	Gln	Lys	Ala	Ile
	210					215					220				
Ala	Gly	Thr	Glu	Val	Lys	Asn	Ala	Ser	Leu	Ser	Ala	Val	Leu	Ser	Asp
225					230					235					240
Lys	Thr	Met	Trp	Gln	Leu	Ile	Ala	Leu	Asn	Phe	Phe	Tyr	Gln	Thr	Gly
				245					250					255	
Ile	Tyr	Gly	Tyr	Thr	Leu	Trp	Leu	Pro	Thr	Ile	Leu	Lys	Glu	Leu	Thr
			260					265					270		
His	Ser	Ser	Met	Gly	Gln	Val	Gly	Met	Leu	Ala	Ile	Leu	Pro	Tyr	Val
		275					280					285			
Gly	Ala	Ile	Ala	Gly	Met	Phe	Leu	Phe	Ser	Ser	Leu	Ser	Asp	Arg	Thr
	290					295					300				
Gly	Lys	Arg	Lys	Leu	Phe	Val	Cys	Leu	Pro	Leu	Ile	Gly	Phe	Ala	Leu
305					310					315					320
Cys	Met	Phe	Leu	Ser	Val	Ala	Leu	Lys	Asn	Gln	Ile	Trp	Leu	Ser	Tyr
				325					330					335	
Ala	Ala	Leu	Val	Gly	Cys	Gly	Phe	Phe	Leu	Gln	Ser	Ala	Ala	Gly	Val
			340					345					350		
Phe	Trp	Thr	Ile												

430

ctt tcg gcg gcc cgc gag cgc ggc atc cgc gtc acc aac acg ccc gac 585
Leu Ser Ala Ala Arg Glu Arg Gly Ile Arg Val Thr Asn Thr Pro Asp

85	90	95	
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Val Leu Thr Lys Asp	Val Ala Asp Leu Gly Ile Ala Met Met Leu Ala		
100	105 110		
cag gcg cgc ggc gtc atc ggc gga gag gcc tgg gtg aag agc ggc gat	681		
Gln Ala Arg Gly Val Ile Gly Gly Glu Ala Trp Val Lys Ser Gly Asp			
115	120 125 130		
tgg gca agc aag ggt ctc tat ccg ctg aag cgc cgc gta cat ggc atg	729		
Trp Ala Ser Lys Gly Leu Tyr Pro Leu Lys Arg Arg Val His Gly Met			
135	140 145		
cgc gcc ggg gtg ctc ggc ctc ggc cgc atc ggc tac gag gtg gcc aag	777		
Arg Ala Gly Val Leu Gly Leu Gly Arg Ile Gly Tyr Glu Val Ala Lys			
150	155 160		
cgc ctt gcc ggc ttc gac atg gac atc gcc tac agc gac acc ggc ccg	825		
Arg Leu Ala Gly Phe Asp Met Asp Ile Ala Tyr Ser Asp Thr Gly Pro			
165	170 175		
aag gat ttc gcc agg gac tgg acc ttc gtc gcc gat ccg gcg gag ctg	873		
Lys Asp Phe Ala Arg Asp Trp Thr Phe Val Ala Asp Pro Ala Glu Leu			
180	185 190		
gcc gcc cgc tcc gac ttc ctc ttc gtc acg ctc gcc gcc tcc gcc gag	921		
Ala Ala Arg Ser Asp Phe Leu Phe Val Thr Leu Ala Ala Ser Ala Glu			
195	200 205 210		
acg cgc cac atc gtc ggc cgc aag gtc atc gag gcg ctc ggc cct gag	969		
Thr Arg His Ile Val Gly Arg Lys Val Ile Glu Ala Leu Gly Pro Glu			
215	220 225		
ggc atg ctg atc aac atc tcg cgc gct tcc aac atc gat gaa agc gcc	1017		
Gly Met Leu Ile Asn Ile Ser Arg Ala Ser Asn Ile Asp Glu Ser Ala			
230	235 240		
ctt ctc gac gcg ctg gag acg aag gcg ctc ggc tcg gcc gcg ctc gac	1065		
Leu Leu Asp Ala Leu Glu Thr Lys Ala Leu Gly Ser Ala Ala Leu Asp			
245	250 255		
gtc ttc gag ggc gag ccg aac ctc aat ccg cgt ttc ctt gcc ctc gac	1113		
Val Phe Glu Gly Glu Pro Asn Leu Asn Pro Arg Phe Leu Ala Leu Asp			
260	265 270		
aac gtc ctc ttg cag ccg cac atg gcc tcc ggc acg atc gag acc cgc	1161		
Asn Val Leu Leu Gln Pro His Met Ala Ser Gly Thr Ile Glu Thr Arg			
275	280 285 290		
aag gcc atg ggc cag ctc gtc ttc gac aac ctg tcg gcc cat ttc gac	1209		
Lys Ala Met Gly Gln Leu Val Phe Asp Asn Leu Ser Ala His Phe Asp			
295	300 305		

ggc cgg ccg ctg ccg acc ccg gtt ctg taaggagaga ggtcc atg aag gcg	1260
Gly Arg Pro Leu Pro Thr Pro Val Leu Met Lys Ala	
310 315	
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Ile Val Ile His Gln Ala Lys Asp Leu Arg Val Glu Asp Ser Ala Val	
320 325 330	
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Glu Ala Pro Gly Pro Gly Glu Val Glu Ile Arg Leu Ala Ala Gly Gly	
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Ile Cys Gly Ser Asp Leu His Tyr Tyr Asn His Gly Gly Phe Gly Thr	
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Val Arg Leu Lys Glu Pro Met Ile Leu Gly His Glu Val Ser Gly His	
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Val Ala Ala Leu Gly Glu Gly Val Ser Gly Leu Ala Ile Gly Asp Leu	
385 390 395	
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Val Ala Val Ser Pro Ser Arg Pro Cys Gly Ala Cys Asp Tyr Cys Leu	
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Lys Gly Leu Ala Asn His Cys Phe Asn Met Arg Phe Tyr Gly Ser Ala	
415 420 425 430	
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Met Pro Phe Pro His Ile Gln Gly Ala Phe Arg Glu Arg Leu Val Ala	
435 440 445	
aag gcc agc cag tgc gtg aag gct gag ggc ctt tcg gca ggt gaa gcc	1692
Lys Ala Ser Gln Cys Val Lys Ala Glu Gly Leu Ser Ala Gly Glu Ala	
450 455 460	
gcg atg gcc gag ccg ctc tcc gtc acg ctt cac gcc acg cgc ccg gcc	1740
Ala Met Ala Glu Pro Leu Ser Val Thr Leu His Ala Thr Arg Arg Ala	
465 470 475	
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Gly Glu Met Leu Gly Lys Arg Val Leu Val Thr Gly Cys Gly Pro Ile	
480 485 490	
ggc acc ctg tcg atc ctc gcc gcc ccg cgc gcc ggc gcg gcg gag atc	1836
Gly Thr Leu Ser Ile Leu Ala Ala Arg Arg Ala Gly Ala Ala Glu Ile	
495 500 505 510	

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Val Ala Ala Asp Leu Ser Glu Arg Ala Leu Gly Phe Ala Arg Ala Val	
515 520 525	
ggc gcg gac cgc acg gtc aac ctg tcg gaa gac cgc gac ggc ctc gtt	1932
Gly Ala Asp Arg Thr Val Asn Leu Ser Glu Asp Arg Asp Gly Leu Val	
530 535 540	
ccg ttc agc gag aac aag gga tat ttc gat gtc ctc tac gaa tgc tcg	1980
Pro Phe Ser Glu Asn Lys Gly Tyr Phe Asp Val Leu Tyr Glu Cys Ser	
545 550 555	
ggc gcc cag ccg gcg ctg gtt gcc ggc atc cag gcc ttg cgc ccg cgc	2028
Gly Ala Gln Pro Ala Leu Val Ala Gly Ile Gln Ala Leu Arg Pro Arg	
560 565 570	
ggc gtc atc gtc cag ctc ggc ctc ggc ggc gag atg agc ctt ccc atg	2076
Gly Val Ile Val Gln Leu Gly Leu Gly Gly Glu Met Ser Leu Pro Met	
575 580 585 590	
atg gcg atc acc gcc aag gaa ctg gac ctg cgc ggc tcc ttc cgc ttc	2124
Met Ala Ile Thr Ala Lys Glu Leu Asp Leu Arg Gly Ser Phe Arg Phe	
595 600 605	
cat gag gaa ttc gcc gtc gcc gtg aag ctg atg cag ggc ggc ctc atc	2172
His Glu Glu Phe Ala Val Ala Val Lys Leu Met Gln Gly Gly Leu Ile	
610 615 620	
gac gtg aag ccg ctg atc acc cat act ttg ccg ctt gcc gat gcg ctt	2220
Asp Val Lys Pro Leu Ile Thr His Thr Leu Pro Leu Ala Asp Ala Leu	
625 630 635	
cag gcc ttc gag atc gcc tcg gac aag ggg caa tcg atg aag act cag	2268
Gln Ala Phe Glu Ile Ala Ser Asp Lys Gly Gln Ser Met Lys Thr Gln	
640 645 650	
atc gca ttc agt taaggaagag cc atg agc atc cag ctt ttc gac ctc acg	2319
Ile Ala Phe Ser Met Ser Ile Gln Leu Phe Asp Leu Thr	
655 660 665	
ggc aag cgc gcc ctc gtc acc ggc tcc tcg cag ggt atc ggc tat gcg	2367
Gly Lys Arg Ala Leu Val Thr Gly Ser Ser Gln Gly Ile Gly Tyr Ala	
670 675 680	
ctc gcc aag ggc ctt gcc gcc gcc ggc gcg gac atc gtc ctc aac ggc	2415
Leu Ala Lys Gly Leu Ala Ala Ala Gly Ala Asp Ile Val Leu Asn Gly	
685 690 695	
cgc gac gcg gcc aag ctg gcg gcc gcg gcg cag gaa ctc ggc gca aag	2463
Arg Asp Ala Ala Lys Leu Ala Ala Ala Ala Gln Glu Leu Gly Ala Lys	
700 705 710 715	
cac acg ctc gcc ttc gac gcc acc gac cat gcc gcc gtg cgc gcg gcc	2511

His Thr Leu Ala Phe Asp Ala Thr Asp His Ala Ala Val Arg Ala Ala	720	725	730	
atc gac gcc ttc gag gcg gag gtc ggc ccc atc gac atc ctc gtc aac	2559			
Ile Asp Ala Phe Glu Ala Glu Val Gly Pro Ile Asp Ile Leu Val Asn	735	740	745	
aat gcc ggc atg cag cac cgc acg ccg ctg gag gat ttc ccc gcc gat	2607			
Asn Ala Gly Met Gln His Arg Thr Pro Leu Glu Asp Phe Pro Ala Asp	750	755	760	
gcc ttc gag cgc atc ctg aag acc aac atc tcg acg gtc ttc aat gtc	2655			
Ala Phe Glu Arg Ile Leu Lys Thr Asn Ile Ser Thr Val Phe Asn Val	765	770	775	
ggc cag gcc gtc gcg cgc cac atg atc gcg cgc ggc gcg ggc aag atc	2703			
Gly Gln Ala Val Ala Arg His Met Ile Ala Arg Gly Ala Gly Lys Ile	780	785	790	795
atc aac atc gcc agc gtg cag acc gcg ctc gcc cgc ccc ggc atc gcg	2751			
Ile Asn Ile Ala Ser Val Gln Thr Ala Leu Ala Arg Pro Gly Ile Ala	800	805	810	
ccc tat acc gcc acc aag ggc gcc gtc ggc aac ctc acc aag ggc atg	2799			
Pro Tyr Thr Ala Thr Lys Gly Ala Val Gly Asn Leu Thr Lys Gly Met	815	820	825	
gcg acc gac tgg gcg aaa tac ggc ctg caa tgc aac gcc atc gcg ccg	2847			
Ala Thr Asp Trp Ala Lys Tyr Gly Leu Gln Cys Asn Ala Ile Ala Pro	830	835	840	
ggc tat ttc gac acg ccg ctc aat gcc gcg ctg gtc gcc gat ccg gcc	2895			
Gly Tyr Phe Asp Thr Pro Leu Asn Ala Ala Leu Val Ala Asp Pro Ala	845	850	855	
ttt tcc gcc tgg ctg gaa aag cgc acg ccg gcc ggc cgc tgg ggc aag	2943			
Phe Ser Ala Trp Leu Glu Lys Arg Thr Pro Ala Gly Arg Trp Gly Lys	860	865	870	875
gtg gag gag ctg atc ggc gcc tgc atc ttt ctt tcc tcc gac gct tcc	2991			
Val Glu Glu Leu Ile Gly Ala Cys Ile Phe Leu Ser Ser Asp Ala Ser	880	885	890	
tcc ttc gtg aac gga cac acg ctc tat gtc gac ggc ggc atc acg gcc	3039			
Ser Phe Val Asn Gly His Thr Leu Tyr Val Asp Gly Gly Ile Thr Ala	895	900	905	
tcg ctc tgaggacaac aggcgcacgc tctgatggg cgtcgccggc tgcggcaagt	3095			
Ser Leu				
ccgcgcgcgc gcgcgcgcgc gcgcgcgcgc tcggtgcgat ccccggttac cgagctcg	3153			

TCGCGCCTCG

<210> 14
 <211> 315
 <212> PRT
 <213> Unknown

<220>
 <223> environmental source

<400> 14

Met	Ser	Lys	Ile	Asp	Val	Leu	Gln	Val	Gly	Pro	Tyr	Pro	Ala	Trp	Asp
1				5					10					15	
Glu	Glu	Arg	Leu	Asn	Ala	Thr	Phe	Thr	Met	His	Arg	Tyr	Phe	Glu	Ala
			20					25					30		
Ala	Asp	Lys	Ala	Ala	Phe	Leu	Ala	Glu	His	Gly	Gly	Thr	Ile	Arg	Gly
		35					40					45			
Ile	Ala	Thr	Arg	Gly	Glu	Leu	Gly	Ala	Asn	Arg	Ala	Met	Ile	Glu	Ala
		50				55					60				
Leu	Pro	Lys	Leu	Glu	Val	Ile	Ser	Val	Tyr	Gly	Val	Gly	Phe	Asp	Ala
65					70					75					80
Val	Asp	Leu	Ser	Ala	Ala	Arg	Glu	Arg	Gly	Ile	Arg	Val	Thr	Asn	Thr
				85					90					95	
Pro	Asp	Val	Leu	Thr	Lys	Asp	Val	Ala	Asp	Leu	Gly	Ile	Ala	Met	Met
			100					105					110		
Leu	Ala	Gln	Ala	Arg	Gly	Val	Ile	Gly	Gly	Glu	Ala	Trp	Val	Lys	Ser
		115					120					125			
Gly	Asp	Trp	Ala	Ser	Lys	Gly	Leu	Tyr	Pro	Leu	Lys	Arg	Arg	Val	His
		130				135					140				
Gly	Met	Arg	Ala	Gly	Val	Leu	Gly	Leu	Gly	Arg	Ile	Gly	Tyr	Glu	Val
145					150					155					160
Ala	Lys	Arg	Leu	Ala	Gly	Phe	Asp	Met	Asp	Ile	Ala	Tyr	Ser	Asp	Thr
				165					170					175	
Gly	Pro	Lys	Asp	Phe	Ala	Arg	Asp	Trp	Thr	Phe	Val	Ala	Asp	Pro	Ala
			180					185					190		
Glu	Leu	Ala	Ala	Arg	Ser	Asp	Phe	Leu	Phe	Val	Thr	Leu	Ala	Ala	Ser
		195					200					205			
Ala	Glu	Thr	Arg	His	Ile	Val	Gly	Arg	Lys	Val	Ile	Glu	Ala	Leu	Gly
		210				215					220				
Pro	Glu	Gly	Met	Leu	Ile	Asn	Ile	Ser	Arg	Ala	Ser	Asn	Ile	Asp	Glu
225					230					235					240
Ser	Ala	Leu	Leu	Asp	Ala	Leu	Glu	Thr	Lys	Ala	Leu	Gly	Ser	Ala	Ala
				245						250				255	
Leu	Asp	Val	Phe	Glu	Gly	Glu	Pro	Asn	Leu	Asn	Pro	Arg	Phe	Leu	Ala
			260					265					270		
Leu	Asp	Asn	Val	Leu	Leu	Gln	Pro	His	Met	Ala	Ser	Gly	Thr	Ile	Glu
		275					280					285			
Thr	Arg	Lys	Ala	Met	Gly	Gln	Leu	Val	Phe	Asp	Asn	Leu	Ser	Ala	His
		290				295					300				
Phe	Asp	Gly	Arg	Pro	Leu	Pro	Thr	Pro	Val	Leu					
305					310					315					

<210> 15
 <211> 343

<212> PRT

<213> Unknown

<220>

<223> environmental source

<400> 15

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Met Lys Ala Ile Val Ile His Gln Ala Lys Asp Leu Arg Val Glu Asp
 1           5           10           15
Ser Ala Val Glu Ala Pro Gly Pro Gly Glu Val Glu Ile Arg Leu Ala
      20           25           30
Ala Gly Gly Ile Cys Gly Ser Asp Leu His Tyr Tyr Asn His Gly Gly
      35           40           45
Phe Gly Thr Val Arg Leu Lys Glu Pro Met Ile Leu Gly His Glu Val
      50           55           60
Ser Gly His Val Ala Ala Leu Gly Glu Gly Val Ser Gly Leu Ala Ile
65           70           75           80
Gly Asp Leu Val Ala Val Ser Pro Ser Arg Pro Cys Gly Ala Cys Asp
      85           90           95
Tyr Cys Leu Lys Gly Leu Ala Asn His Cys Phe Asn Met Arg Phe Tyr
      100           105           110
Gly Ser Ala Met Pro Phe Pro His Ile Gln Gly Ala Phe Arg Glu Arg
      115           120           125
Leu Val Ala Lys Ala Ser Gln Cys Val Lys Ala Glu Gly Leu Ser Ala
      130           135           140
Gly Glu Ala Ala Met Ala Glu Pro Leu Ser Val Thr Leu His Ala Thr
145           150           155           160
Arg Arg Ala Gly Glu Met Leu Gly Lys Arg Val Leu Val Thr Gly Cys
      165           170           175
Gly Pro Ile Gly Thr Leu Ser Ile Leu Ala Ala Arg Arg Ala Gly Ala
      180           185           190
Ala Glu Ile Val Ala Ala Asp Leu Ser Glu Arg Ala Leu Gly Phe Ala
      195           200           205
Arg Ala Val Gly Ala Asp Arg Thr Val Asn Leu Ser Glu Asp Arg Asp
      210           215           220
Gly Leu Val Pro Phe Ser Glu Asn Lys Gly Tyr Phe Asp Val Leu Tyr
225           230           235           240
Glu Cys Ser Gly Ala Gln Pro Ala Leu Val Ala Gly Ile Gln Ala Leu
      245           250           255
Arg Pro Arg Gly Val Ile Val Gln Leu Gly Leu Gly Gly Glu Met Ser
      260           265           270
Leu Pro Met Met Ala Ile Thr Ala Lys Glu Leu Asp Leu Arg Gly Ser
      275           280           285
Phe Arg Phe His Glu Glu Phe Ala Val Ala Val Lys Leu Met Gln Gly
      290           295           300
Gly Leu Ile Asp Val Lys Pro Leu Ile Thr His Thr Leu Pro Leu Ala
305           310           315           320
Asp Ala Leu Gln Ala Phe Glu Ile Ala Ser Asp Lys Gly Gln Ser Met
      325           330           335
Lys Thr Gln Ile Ala Phe Ser
      340

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TOPOLOGY

<210> 16
 <211> 251
 <212> PRT
 <213> Unknown

<220>
 <223> environmental source

<400> 16
 Met Ser Ile Gln Leu Phe Asp Leu Thr Gly Lys Arg Ala Leu Val Thr
 1 5 10 15
 Gly Ser Ser Gln Gly Ile Gly Tyr Ala Leu Ala Lys Gly Leu Ala Ala
 20 25 30
 Ala Gly Ala Asp Ile Val Leu Asn Gly Arg Asp Ala Ala Lys Leu Ala
 35 40 45
 Ala Ala Ala Gln Glu Leu Gly Ala Lys His Thr Leu Ala Phe Asp Ala
 50 55 60
 Thr Asp His Ala Ala Val Arg Ala Ala Ile Asp Ala Phe Glu Ala Glu
 65 70 75 80
 Val Gly Pro Ile Asp Ile Leu Val Asn Asn Ala Gly Met Gln His Arg
 85 90 95
 Thr Pro Leu Glu Asp Phe Pro Ala Asp Ala Phe Glu Arg Ile Leu Lys
 100 105 110
 Thr Asn Ile Ser Thr Val Phe Asn Val Gly Gln Ala Val Ala Arg His
 115 120 125
 Met Ile Ala Arg Gly Ala Gly Lys Ile Ile Asn Ile Ala Ser Val Gln
 130 135 140
 Thr Ala Leu Ala Arg Pro Gly Ile Ala Pro Tyr Thr Ala Thr Lys Gly
 145 150 155 160
 Ala Val Gly Asn Leu Thr Lys Gly Met Ala Thr Asp Trp Ala Lys Tyr
 165 170 175
 Gly Leu Gln Cys Asn Ala Ile Ala Pro Gly Tyr Phe Asp Thr Pro Leu
 180 185 190
 Asn Ala Ala Leu Val Ala Asp Pro Ala Phe Ser Ala Trp Leu Glu Lys
 195 200 205
 Arg Thr Pro Ala Gly Arg Trp Gly Lys Val Glu Glu Leu Ile Gly Ala
 210 215 220
 Cys Ile Phe Leu Ser Ser Asp Ala Ser Ser Phe Val Asn Gly His Thr
 225 230 235 240
 Leu Tyr Val Asp Gly Gly Ile Thr Ala Ser Leu
 245 250

<210> 17
 <211> 32
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 17
 acccaagctt caccaaaaga gtgaagagga ag

<220>
<223> synthetic construct

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<210> 19
<211> 34
<212> DNA
<213> Artificial Sequence
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<220>
<223> synthetic construct

```
<400> 19
agactctaga tccacataaa cgcactgcgt aaac 34
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<210> 20
<211> 33
<212> DNA
<213> Artificial Sequence
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<220>
<223> synthetic construct

<400> 20
gaggggatcc tggettcgtg aacgatatac tgg 33

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<210> 21
<211> 31
<212> DNA
<213> Artificial Sequence
```

<220>
<223> synthetic construct

```
<400> 21
aataggatcc ttcatcacca gaatatTTTT a 31
```

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<210> 22
<211> 28
<212> DNA
<213> Artificial Sequence
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<220>
<223> synthetic construct

